A ROTIFER EPIPHYTIC ON A GREEN FILAMETOUS ALGA

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INTRODUCTION

Algae are able to form associations with a variety of organisms from both Plant and Animal Kingdoms (see for example, El-Saadawi and Abou El-Kheir, 1973; Richardson, 1981; Abou El-Kheir et al. 1986a). The plant associated with the alga may be chlorophylous or achlorophyllus. Algal associations with the latter type of organisms are the lichens in which the mode of association is symbiotic. Algal association with green plants varies from epiphytism to intracellular endophytism (see Darwish, 1984). The green plant associated with the alga may be another alga (El-Nayal, 1931; Abou El-Kheir and Al-Qadaib, 1986), a brgophyte (El-Saadawi and Abou El-Kheir, 1973; El Saadawi et al., 1986; Abou El-Kheir et al. 1986a), or an aquatic vascular macrophyte (El-Nayal, 1935; Eminson, 1978; Abou El-Kheir and Ismail, 1986 a,b and Abou El-Kheir et al. 1986b). Algae also form associations with animals. Thus certain snails occur closely associated and intermingled with Cladophora (Chlorphyceae) filaments in innumerable counts which drove Mohsen and Bokhary (1969) to suggest a possible symbiotic relation between the alga and the animals. Furthermore a number of species of green algae live as epiphytes on animals and still others (Chlorella for example)are endophytic in the cells of certain protozoa (e.g. Paramecium), coelentrates and sponges (Blod, 1973; Goldman and Horne,1983).

The mode of association varies greatly between the two partners in each case of association, however, little is known about the exact relationship between the two partners in many of these associations (Abou El-Kheir et al., 1986a).

The main concern in this paper, however, is to put on record a peculiar association between an animal and a filamentous alga in waters collected from Egypt (Mekkey, 1984) and Saudi Arabia (Al-Qadaib, 1986). As far as the authors are aware this is the first record of an animal epiphytic on an alga.

MATERIAL AND HABITAT DESCRIPTION

The material consists of three samples; one collected from Egypt and two from Saudi Arabia. The three samples contained filamentous algae of which one type of filaments was relatively but prominently larger than the other types of filaments. Scores of an animal (a metazoan) were seen attached only to this type of large algal filaments in the three samples. Less numbers of this microscopic metazoan were seen free in the water.

The large algal filaments have been determined as belonging to species of the genus Enteromorpha; namely E. flexuosa (Wulten ex Roth) J. Agardh in the Egyptian sample (Fig. 1), E. compressa Grev. in the first Saudi

Arabian sample and E. ramulosa (Engl. Bot.) Hooker in the second Saudi Arabian sample. Enteromorphas are thalloid Ulvaceae that are essentially marine, but some occur in fresh-water (Fritsch, 1961). The three Enteromorphas recorded here are attached marine forms capable of existing in a rather wide range of salinities.

The animal epiphyte (Fig. 1) was kindly identified by Dr. Magdi Tawfiek (Zoology Dept., Ain Shams Univ.) as a species of the genus Filinia or of the genus Pedetes. Both belong to the Rotifera which includes over 1800 spp. (Goldman and Horne, 1983). Most rotifers occur in freshwaters, but some occur in saline waters. Most rotifers attach to solid substrates with their foot and creep in leechlike fashion (Goldman and Horne, 1983).

Description of the habitats in which these organisms exist, estimation of nutrients present in the water samples and other details are given in the two following tables.

Table 1. Habitat details: date of collection, sample no., kind and source of water, locality, and algal flora recorded in the three samples.

Alga	E. flexuosa	E. compressa	E. ramulosa
Date of collection	9.3.1979	10.2.1984	13.7.1984
Sample ref. no.	7	2	15
Kind of water	Brackish	Brackish	Saline
Source of water	A stagnant swamp	An irrigation stream in a plant nursery	A salt marsh
Locality	Helwan City, near Ciaro, Egypt	Kharj City, near Riyadh, Saudi Arabia	Khobar City, near Dammam, Saudi Arabia
Algal flora in samples:			
Diatoms	12 species	30 species	33 species
Blue-greens	5 species	15 species	13 species
Greens	1 species	2 species	5 species
Reds	-	-	1 species
No. of filamentous forms other than Enteromorpha	5 blue-greens	12 blue-greens 1 greens	9 blue-greens 1 greens 1 reds
State of occurrence of Enteromorpha	Predominant	Common	Common

Table 2. Values of pH, temperature, and nutrients (estimated as p.p.m. except Cl as gm/l) of the three samples.

Sample No.	Alga	pH	Temp. °C	NO_3	PO_4	K	Mg	Ca	Na	Cl gm/L
7	E. Flexuosa	9	16	0.0	1.4	23.4	6.2	10.1	1150	11.2
2	E. compressa	7.7	26	18.4	6.2	55	154	444	320	0.5
19	E. ramulosa	7.7	33	0.0	4.7	925	1929	417	16300	23.7

The habitat particulars in the two tables are given to show the ecological range in which this association occurs.

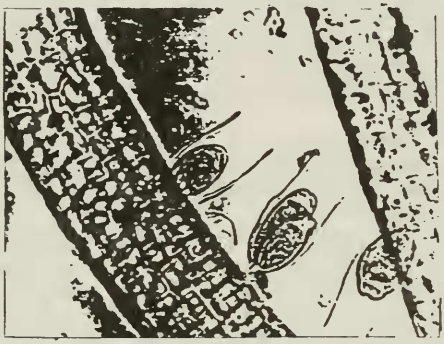

Fig. 1. Three individuals of the rotifer growing epiphytically on filaments of Enteromorpha flexuosa collected from Helwan, Egypt. Note that one individual is in state of division into two. X 400.

CONCLUDING REMARKS

The occurrence in the present work of the same rotifer epiphyte on 3 different species of Enteromorpha in Egypt and Saudi Arabia means that this rotifer is widespread or cosmopolitan. In fact many rotifers are cosmopolitan (Goldman and Horne, 1983). The iteration of this association in 3 widely separated localities cannot be easily overlooked specially that the rotifer does not attach itself to other forms of filamentous algae present in the three samples (see table 1). The large size of the filaments of the recorded Enteromorphas compared to other filamentous algae may drive one to think that this association is brought about most probably by Enteromorpha filaments forming a suitable substrate for the rotifer or by dependence of the latter on the alga for epiphytism. The long thick filaments of the alga allow ideal positions for the numerous individuals of this omnivorous rotifer; suitable for the process of drawing in suspended food particles. Thus it is not only a mere similarity of ecological amplitude between the epiphyte and the host. However, little is known about the relationship of epiphytes with their host plants (see also Prowse, 1959).

REFERENCES

Abou El-Kheir, W.S. and Al Qadaib, S.A., 1986.Notes on the algal flora of Saudi Arabia: 417 new records (in preparation).

———————— and Ismail, G.H., 1986a. Notes on the aquatic habitats of macrohydrophytes and associated algae in various regions in Egypt. 1. El-Fayum region. Phytologia 60:469-482.

————————————, 1986b. Notes on the aquatic habitats of macrohydrophytes and associated algae in various regions in Egypt. 3. Governorates of Giza, Cairo, Qalyubia and Sharkia. Univ. Coll. for Girls, Ann. Rev. (accepted).

————————————, El-Saadawi, W.E. and Darwish, M.H., 1986a. A peculiar algal-moss association from El-Giza, Egypt. Arab Gulf J. Scient. Res. 4:69-75.

————————————, Hammouda, M.A., and Ismail, G.H., 1986b. Notes on the aquatic habitats of macrohydrophytes and associated algae in various regions in Egypt. 2. Ismailia canal and nearby water bodies from Cario to Ismailia city. Ain Shams Sci. Bull. 28. (accepted).

Al-Qadaib, S.A., 1986. Studies on the distribution of the algal flora in different regions of Saudi Arabia and its relation with some environmental factors, M.Sc. Thesis, Fac. of Education for Girls, Riyadh, Saudi Arabia.

Bold, H.C., 1973. Morphology of plants. Harper and Row, New York, 668p.

Darwish, M.H., 1984. Studies on algae and mosses occurring together in their natural habitats, M.Sc. Thesis, Univ. of Ain Shams, Cairo, Egypt.

El-Saddawi, W.E., and Abou El-Kheir, W.S., 1973. On some Egyptian mosses and the algal flora in their habitats. Proceedings of the Egyptian Academy of Sciences, 26:125-136.

————————————, Abou El-Kheir, W.S., and Darwish, M.H., 1986. Micropoma niloticum (Del.) Lindb. (Musci) with corm-like stem bases. Phytologia, 60:98-100.

Eminson, D., 1978. A comparison of diatom epiphytes, their diversity and density, attached to Myriophyllum spicatum L. in Norfolk Dykes and Broads. Phycol. J., 13(1), 57.

El-Nayal, A.A., 1931. An enumeration of Egyptian Chlorphyceae and Cyanophyceae. Extrait de la Revue Algologique, 177-195.

————————————, 1935. Egyptian freshwater algae. Bull. Fac. Sc. no. 4:1-106.

Fritsch, F.E., 1961. The structure and reproduction of the algae. Vol. 1, Cambridge Univ. Press.

Goldman, C.R. and Horne, A.J., 1983. Limnology. Mc Graw-Hill.

Mekkey, L.E., 1984. Studies on the algal flora of different water sources in Egypt. M.Sc. Thesis. Univ. Coll. For Girls, Ain Shams Univ. Egypt.

Mohsen, A.F. and Bokhary, H.A., 1969. A study of distirbution and periodicity of freshwater algae in Riyadh area as related to environment. Bull. Fac. Sci., Riyadh Univ. 1:2-27.

Prowse, G.A., 1959. Relationship between epiphytic algal species and their macrophyte hosts. Nature, Lond. 183,:1204-5.

Richardson, D.H.S., 1981. The biology of Mosses. Blackwell, Lond. 220p.